ABSTRACT

A method for controlling partial air pressure in an intake manifold of an engine. The engine has an intake throttle device for controlling a flow of air to the intake manifold. An EGR valve is provided for controlling a flow of exhaust gas from the engine to the intake manifold downstream of the intake throttle. The engine has at least one cylinder fed a flow comprising air passing through the throttle to the intake manifold and exhaust products passing through the EGR valve to the intake manifold. Both the air through the throttle and the exhaust gas products in the intake manifold are passed as a combined flow to the intake manifold and then to the at least one cylinder. The method includes: specifying a dynamic reference model for the desired partial pressure of the air as a function of time; and controlling the flow through the intake throttle device in accordance with an estimated EGR flow obtained by a dynamic observer and an estimate of partial air fraction in the exhaust gas products. In one embodiment, the partial air fraction is estimated in accordance with intake to exhaust delay and fuel injection to exhaust delay. In one embodiment the dynamic observer does not require information of engine exhaust temperature, engine exhaust pressure, or EGR valve position.